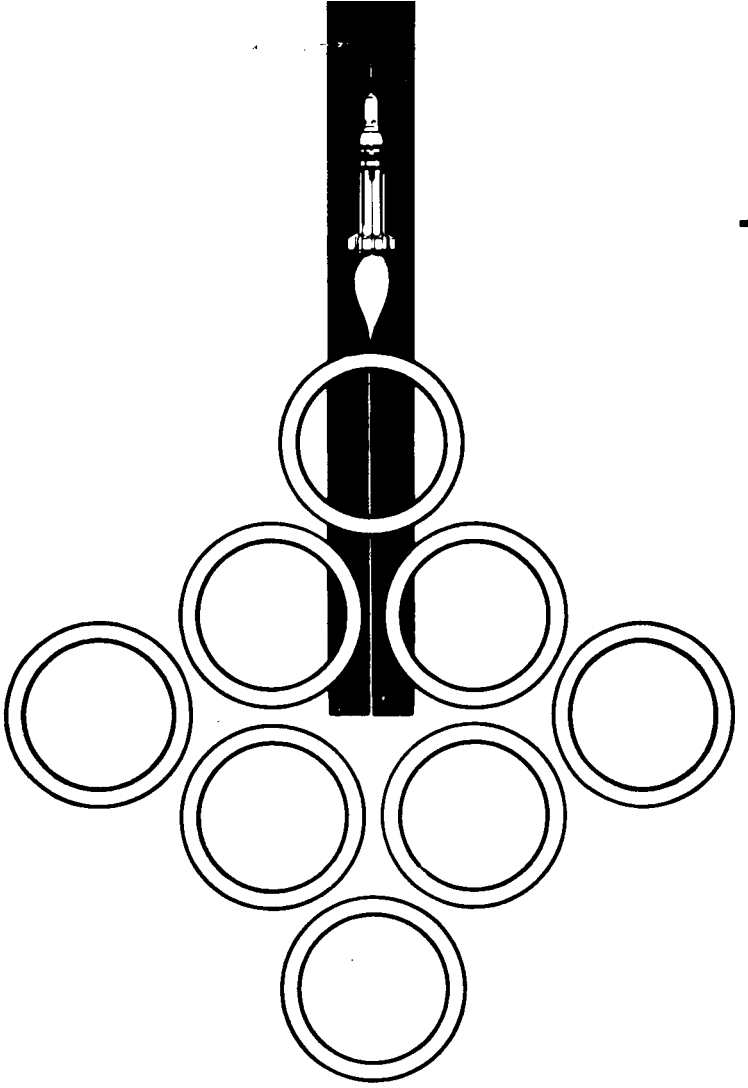

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Saturn I

LAUNCH VEHICLE SA-10 AND LAUNCH COMPLEX 37B FUNCTIONAL SYSTEMS DESCRIPTION

Volume IV

NITROGEN AND HELIUM STORAGE FACILITY FUNCTIONAL DESCRIPTION, INDEX OF FINDING NUMBERS, AND MECHANICAL SCHEMATICS

SPACE DIVISION CHRYSLER CORPORATION

SATURN I
LAUNCH VEHICLE SA-10
AND
LAUNCH COMPLEX 37B
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NITROGEN AND HELIUM STORAGE FACILITY FUNCTIONAL DESCRIPTION, INDEX OF FINDING NUMBERS, AND MECHANICAL SCHEMATICS

JULY 1964

CHRYSLER CORPORATION SPACE DIVISION - NEW ORLEANS, LOUISIANA

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FOREWORD

This volume is one of a set of eleven volumes that describe mechanical and electro-mechanical systems of the Saturn I, SA-10 launch vehicle and launch complex 37B. The eleven-volume set is prepared for the Functional Integration Section, Systems Integration and Operations Branch, Vehicle Systems Division, P&VE Laboratory, MSFC, by Systems Engineering Branch, Chrysler Corporation Space Division under Contract NAS 8-4016. Volume titles are listed below:

Volume I	RP-1 Fuel System
Volume II	LOX System
Volume III	LH_2 System
Volume IV	Nitrogen and Helium Storage Facility
Volume V	Pneumatic Distribution System
Volume VI	Environmental Conditioning Systems
Volume VII	Launch Pad Accessories
Volume VIII	H-1 Engine and Hydraulic System
Volume IX	RL10A-3 Engine and Hydraulic System
Volume X	Separation and Flight Termination Systems
Volume XI	Supplement: Legend and Composite Schematic

The technical content of this volume reflects the most up-to-date design information available from the S-I/S-IB Project Engineer, R-P&VE on June 15, 1964.

System mechanical schematics are provided in section 3 to support the functional description of the system. The index of finding numbers in section 2 provides physical and functional descriptions of components identified on the mechanical schematics.

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SECTION 1

FUNCTIONAL DESCRIPTION

1.1 INTRODUCTION

The nitrogen and helium storage facility is the source of all gaseous nitrogen (GN_2) and gaseous helium (He) used in launch complex 37B and the SA-10 launch vehicle. The facility contains two functional systems; a nitrogen system and a helium system. Figure 1-1 illustrates these two systems in block diagram form.

The nitrogen system supplies 6000-psig GN_2 to the pneumatic control distributor (PCD) (volume V), 3500-psig GN_2 to the RP-1, LOX, and LH_2 control panels (volumes I, II, and III, respectively), and 50-psig GN_2 to the environmental control system (ECS) (volume VI). The nitrogen system consists of a liquid nitrogen (LN_2) storage tank, four LN_2 converters, four high-pressure vaporizers, a low-pressure vaporizer, two filter networks, and a GN_2 storage battery.

Three of the LN_2 converters deliver LN_2 from the storage tank to the vaporizers at 6000 psig; the fourth converter and respective circuit remains on standby. The vaporizers convert LN_2 to GN_2 which is then filtered and routed at 6000 psig to the GN_2 storage battery. Gaseous nitrogen is distributed from the storage battery to the pneumatic control panels and PCD.

Liquid nitrogen at 65 psig is routed from the LN_2 storage tank to the low-pressure vaporizer. The 50-psig GN_2 output from the vaporizer is delivered to the ECS to provide a conditioned environment in the launch vehicle.

The helium system supplies the PCD with gaseous helium at 6000 psig. The helium system consists of three compressors, a purifier-regulator system, and a helium storage battery.

Gaseous helium is supplied to the system from supply trailers connected to the inlet lines. Helium at 2200 psig from the supply trailer tube bank is reduced to 120 psig and fed into the compressors where it is compressed, purified, and the output regulated to 6000 psig. The high-pressure output from the compressors is passed through a second purification-regulation stage and is then stored in the helium storage battery.

1.2 NITROGEN STORAGE FACILITY COMPONENT DESCRIPTION

The majority of nitrogen storage facility components are adequately described in section 2. Detailed descriptions of several of the more complex components are presented in following paragraphs.

1.2.1 LN_2 Storage Tank - Storage Tank A1150 (figure 3-1) is filled from an external source and has a capacity of 35,000 gallons. The tank supplies LN_2 at 65 psig to the converters in the high-pressure vaporizers and to the low-pressure vaporizers. The pressure in the storage tank ullage space is maintained between 63 and 66 psig. Liquid

nitrogen is converted into GN_2 in Vaporizer A1189 and then routed to the ullage space for this purpose. Pressure Regulators A1190 and A1185 and Pneumatic Controller A1188 provide the necessary ullage space pressure control.

1.2.2 LN_2 Pump - The four cryogenic fluid pumps (A1093, A1108, A1138, and A1208) are contained within Converters A772, A1107, A1142, and A1075, respectively. Each pump has five cylinders and is a vacuum-jacketed, single-acting, positive-displacement type. Each pump has three sections.

1. Cold end - contains pistons, cylinders, and valves and operates at LN_2 temperature.

2. Drive or warm end - contains bearing drive shaft and cam and operates at ambient temperature.

3. Interbody - contains push rods and separates the warm and cold ends to provide the necessary heat-loss barrier.

Corrosion resistant stainless steel is used for all parts that come into contact with LN_2. Each pump is driven at a speed of 870 rpm by a separate 50-hp electric motor, has a discharge rate of 10.8 gpm, and is designed to operate with a minimum inlet pressure of 15 psi (NPSH). A special lubricant, having no hydrocarbon content, is used to lubricate the pump drive. Pump safety devices are provided as follows: (1) lubricant temperature switch shuts down system if lubricant temperature exceeds 150 F, (2) lubricant pressure switch shuts down system if lubricant differential case pressure falls below 15 psig, (3) sump pressure relief valve operates at 200 psig, (4) sump pressure burst disc ruptures at 250 psig, (5) discharge temperature switch shuts down system if temperature falls below 0 F, and (6) discharge pressure switch shuts down system if pressure rises to 6700 psig.

1.2.3 High Pressure Vaporizer - Each of the four high pressure vaporizer assemblies (A1132, A1123, A1084, and A785) has two vaporizer sections which are operated in parallel to obtain the required vaporization capacity. Each vaporizer section includes a heat exchanger system, a vaporizer coil assembly, an air circulation fan, a heat transfer fluid reservoir, a circulating pump, and a drive motor. The vaporizer coil is a two-fluid counterflow unit (heat transfer fluid and LN_2). The air circulation fan and heat transfer fluid pump in each vaporizer is driven by a single 20-hp electric motor operating at 3600 rpm from 440-volt, 3-phase AC.

1.2.4 Tank Ullage Vaporizer - The storage tank ullage space vaporizer (A1189) features welded aluminum construction, and a cast aluminum fan. A 15-hp electric motor drives two 42-inch fans at 1224 rpm to deliver air at the rate of 40,000 cfm. The motor operates at 1760 rpm from 440-volt, 3-phase AC.

1.2.5 Low Pressure Vaporizers - Low pressure vaporizers (A1072 and A1229) consist of three identical modules, each of which contain a finned and plain tubing vaporizer unit and a propeller type 6-blade fan that is driven by a 30-hp electric motor. The fan delivers air at the rate of 100,000 cfm at a pressure of 0.8 inch H_2O. Each

vaporizer assembly is capable of vaporizing up to 200 gpm of LN_2. The discharge temperature of the vaporized nitrogen gas is within 30 F of ambient and has a pressure drop of less than 5 psi from the 150-psig input pressure.

1.2.6 GN_2 Storage Battery - The GN_2 storage battery consists of six pairs of storage tanks: A1260 and A858, A864 and A863, A896 and A897, A887 and A886, A873 and A874, and A852 and A851. The storage capacity of each tank is 200 cu. ft. at 6000 psig. The GN_2 battery storage capacity is therefore 2400 cu. ft. at 6000 psig. Each pair of tanks has the required group of manual valves, gages, relief valves and feeds into a common output manifold and a common vent line.

1.2.7 GN_2 Control Devices - Major control devices for the GN_2 system include a pneumatic controller, two differential pressure operated pressure regulators, a pressure regulator, and a back pressure controlled pressure regulator. These devices are individually described as follows:

a. Pneumatic Controller A1188 samples LN_2 Storage tank ullage pressure and reduces it to a proportionately lower pressure. As the sampled pressure varies, the reduced output pressure from the controller varies.

b. Differential pressure operated Pressure Regulators A1185 (normally closed) and A1190 (normally opened) function in much the same manner. Both regulators operate on a difference in pressure between actual ullage pressure and the output pressure from Pneumatic Controller A1188. Pressure Regulator A1185 cracks at 10 psid and is fully open at 15 psid. Pressure Regulator A1190 starts to close at 3 psid and is fully closed at 9 psid.

c. Pressure Regulator A1267 (figure 3-3) is adjusted to reduce the pressure supplied from the GN_2 Storage Battery to 3500 psig. The regulator maintains the pressure at 3500 psig regardless of flow. The pressure regulator output is routed to the LOX, RP-1, and LH_2 pneumatic control panels.

d. Back pressure operated Pressure Regulator A1253 (figure 3-1) prevents the flow of GN_2 from the purification unit until back pressure reaches 3500 psig. The regulator is initially closed, causing back pressure to build up rapidly to 3500 psig. The regulator then opens and allows GN_2 to flow to the storage battery at a nominal line pressure of 3500 psig. As the storage battery fills, back pressure will increase toward the pumping pressure of the vaporizer.

1.3 NITROGEN STORAGE FACILITY OPERATION

The three major functions associated with operation of the GN_2 storage facility are as follows: LN_2 storage tank pressurization, GN_2 transfer to the environmental control system, and GN_2 transfer to the fuel pneumatic control panels and the pneumatic control distributor.

1.3.1 LN_2 Storage Tank Pressurization - Storage Tank A1150 (figure 3-1) is pressurized to provide a positive pressure head for LN_2 pumping operations. The storage

tank is pressurized by LN_2 that is drawn from the storage tank, converted to GN_2, and returned to the ullage section of the tank.

1.3.1.1 Preparation. Preparations for the pressurization sequence are as follows:

a. Manual Valves A1157 and A1187 are opened.

b. Manual Valve A1186 is closed to transfer venting control to Pressure Regulator A1185.

c. Manual Valve A1191 is closed to transfer pressurizing control to flow control Pressure Regulator A1190.

d. Pneumatic Controller A1188, and Pressure Regulators A1185 and A1190 are adjusted to satisfy operating requirements.

1.3.1.2 Pressurization. Manual Valve A1161 is opened to allow LN_2 from the storage tank to flow to the pressurization system. Liquid nitrogen flows through normally open Pressure Regulator A1190 to Vaporizer A1189 where it is converted to GN_2 and then discharged into the tank ullage section. Relief Valve A1192 operates at 150 psig to protect the lines and components downstream of Manual Valve A1161 from overpressurization.

As ullage pressure increases to approximately 25 psig, output pressure from Pneumatic Controller A1188 begins to close Pressure Regulator A1190 to reduce the rate of tank pressurization. At an ullage pressure of 63 psig, the controller output pressure causes the regulator to close and stop tank pressurization. Heat from the tank walls and the pressurizing gas induces LN_2 boiloff which may in turn cause tank pressure to exceed 63 psig. At 66 psig, pneumatic controller output causes Pressure Regulator A1185 to open. Excess GN_2 flows from the storage tank through the pressurization line, Manual Valve A1187, Pressure Regulator A1185, and Check Valve A1184 to the atmosphere. The system cycles throughout the launch sequence to maintain the storage tank pressure between 63 and 66 psig.

If Pneumatic Controller A1188, Pressure Regulator A1190, or Pressure Regulator A1185 should fail, pressurization and venting may be maintained by operation of Manual Valves A1191 and A1186. Storage tank ullage pressure is indicated by Pressure Gage A1158.

1.3.2 GN_2 Transfer to Environmental Control System - Liquid nitrogen from Storage Tank A1150 (figure 3-1) is converted to GN_2 in low-pressure Vaporizers A1072 or A1229. The GN_2 is then transferred to the environmental control system (ECS).

1.3.2.1 Preparation. Preparations required prior to transferring GN_2 to the ECS are as follows:

a. Transfer line Manual Valve A1179 and venting Manual Valve A1182 are closed.

b. Both Manual Valves A1073 and A1221 are closed.

c. Vaporizer discharge manifold venting Manual Valve A1232 is closed.

1.3.2.2 Transfer. Vaporizer A1072 operates and Vaporizer A1229 remains on standby. Manual Valve A1221 is opened and LN_2 flows to Vaporizer A1072; Manual Valve A1073 remains closed as long as Vaporizer A1229 is on standby.

Manual Valve A1165 is opened and LN_2 flows from Storage Tank A1150 through Strainer A1175 past Relief Valve A1177 to Manual Valve A1179. Manual Valve A1179 is opened and LN_2 flows past Relief Valve A1181 through Manual Valve A1221 past Pressure Gage A1180, into Vaporizer A1072. Gaseous nitrogen flows from the vaporizer past Pressure Transducer A1233 and Temperature Transducer A1234 through Flowmeter A1235 to the ECS.

Measurements from the pressure transducer and the temperature transducer are used to convert the flowmeter readings to standard cubic feet per minute (scfm). Vaporizer output is monitored by the flowmeter and is controlled by adjusting Manual Valve A1179. The manual valve is adjusted to produce a pressure of 50 psig at the output of the flowmeter. This corresponds to an output pressure at the ECS of approximately 10 to 30 psig.

Standby Vaporizer A1229 is used whenever Vaporizer A1072 must be defrosted due to icing. Manual Valve A1221 is closed to shut off the flow of LN_2 to Vaporizer A1072. The standby vaporizer is then started and Manual Valve A1073 is opened.

Vaporizers A1072 and A1229 are shut down in the following manner when the ECS no longer requires GN_2. Manual Valves A1165, A1221, and A1073 are closed. Manual Valve A1182 is opened to vent the transfer line between Storage Tank A1150 and the vaporizer inlets. Liquid nitrogen flows through Check Valve A1198 before it is exhausted to the atmosphere. The vaporizer discharge manifold is vented by opening Manual Valve A1232. Gaseous nitrogen passes through Check Valve A1389 before it is exhausted to the atmosphere.

1.3.3 GN_2 Transfer to Pneumatic Control Distributor and Propellant Pneumatic Control Panels - Liquid nitrogen is transferred from Storage Tank A1150 (figure 3-1) to three operating LN_2 to GN_2 high-pressure converter compressor units. A fourth converter-compressor unit remains on standby in case one of the operating units fail. Liquid nitrogen is first converted to GN_2 by passing it through three vaporizers. From the vaporizers, the 6000-psig GN_2 flows to the storage battery for storage and subsequent distribution to the PCD and the pneumatic control panels of the propellant systems.

Since the four high-pressure LN_2 to GN_2 converter systems are identical, only the operation of Converter A1142 in conjunction with Vaporizer A1132 is discussed. Converters A1117, A772, and A1075 with Vaporizers A1123, A1085, and A785, respectively, are operated in a like manner.

1.3.3.1 Preparation. Preparations required for transferring GN_2 to the PCD and the propellant pneumatic control panels are as follows:

a. GN_2 storage facility (figure 3-3) pressure gage Manual Valves A912, A910, A1344, A857, A905, A862, A866, A900, A895, A885, A889, A844, A877, A872, A841, A850, A854, A842, A843, A917, A914, and A920 are opened.

b. LN_2 converter venting Manual Valve A1144 (figure 3-1) is opened.

c. Manual Valves A1201, A1202, A1206, A1212, A1074, and A1225 are closed placing Converter A1075, and Vaporizer A785 on standby.

d. Transfer line vent Manual Valve A1183, vaporizer supply header vent Manual Valves A1102 and A1220, LN_2 converter vent Manual Valve A1143, LN_2 pump discharge vent Manual Valve A1133, vaporizer discharge manifold vent Manual Valve A1237, desiccant holder venting Manual Valves A932 and A933, GN_2 purification unit discharge line Manual Valves A1245, A926, and A1256, and Manual Valve A927 are closed. GN_2 storage battery (figure 3-3) Manual Valves A1305, A909, A1275, A908, A1258, A893, A890, A870, and A855, and pneumatic control distributor line Manual Valve A1266 are closed.

e. Pumping facility Manual Valves A1103 and A1218 (figure 3-1) and LN_2 converter Manual Valve A1114 are opened.

f. Vaporizer discharge line Manual Valve A1130 is opened.

g. Manual Valve A928 or Manual Valve A929 must be opened to admit GN_2 to one side of the hydrocarbon removal units; the other side remains on standby. In a like manner, either Solenoid Valve A938 or Solenoid Valve A939 must be opened to admit GN_2 to one side of the water-vapor removal units.

h. Pneumatic Pressure Regulator A1253 in the storage battery supply line is adjusted for a back pressure of 3500 psig, and Manual Valve A1246 is closed.

i. Storage battery supply line Manual Valve A1298 (figure 3-3) and GN_2 storage tank Manual Valves A1272, A903, A902, A881, A879, and A846 are opened.

j. Manual Valves A1268, A916, A913, and A1278 in the GN_2 distribution lines are closed.

k. Pressure Regulator A1267 in the fuel system pneumatic control panels supply line is adjusted for a downstream pressure of 3500 psig.

1.3.3.2 Transfer. Manual Valve A1164 (figure 3-1) is opened and 65 psig LN_2 flows through Strainer A1176 past 150 psig Relief Valve A1178 through the transfer line into the LN_2 converter supply header. The converter supply header is protected by Relief Valves A1217 and A1104 which vent pressure in excess of 150 psig. Liquid nitrogen in the supply header passes through converter Manual Valves A1103 and A1218 and Manual Valve A1114 into LN_2 Converter A1142.

Liquid nitrogen at -320 F vaporizes upon entering the relatively warm converter and is vented to atmosphere through Manual Valve A1144 and Check Valve A1198 in the vent line. The converter continues to cool down to LN_2 temperature.

Converter discharge Manual Valve A1133 and blowby Manual Valve A1146 are opened. When cooldown has been accomplished, Vaporizer A1132 and Pump A1138 are started. Air trapped in the converter discharge lines is bled through Manual Valve A1133. The valve is closed when a steady stream of LN_2 flows.

Low pressure Manual Valve A1144 is gradually closed to prevent LN_2 Pump A1138 from cavitating. Should the pump begin to cavitate, low pressure Manual Valve A1143 is opened and GN_2 is vented to the atmosphere. The manual valve is closed when the pump no longer experiences cavitation. Pump blowby Manual Valve A1146 is slowly closed until LN_2 pump blowby pressure, indicated by Gage A1147, is approximately equal to LN_2 converter input pressure indicated by Gage A1149.

Overpressure protection for the LN_2 converter and LN_2 pump blowby lines is provided by Relief Valves A1148 and A1145 which vent excess LN_2 at 200 and 150 psig, respectively.

Vaporizer discharge pressure is indicated by Pressure Gage A1135. Pressure switch A1136 actuates and shuts down the LN_2 pump if pump discharge pressure exceeds 6700 psig. Overpressure protection in the discharge line is provided by Relief Valve A1131 which vent excess GN_2 at 6800 psig to the atmosphere.

Temperature Switch A1128 actuates when the temperature rises to 0 F or above to protect the LN_2 pump from overheating.

Discharge line pressure is indicated by Pressure Gage A1239. Relief Valve A1236 vents excess GN_2 at 6400 psig to the atmosphere. Gaseous nitrogen from the vaporizer discharge line passes through Check Valves A1129 and A1250, Manual Valve A928, Desiccant Holder A934, and Check Valve A937, or through Manual Valve A929, Desiccant Holder A931, and Check Valve A936. Manual Valves A933 and A932 may be opened to drain collected hydrocarbons when the system is not operating.

Gaseous nitrogen enters the water vapor removal unit through Solenoid Valve A938, Desiccant Holder A942, and Check Valve A944, or through Solenoid Valve A939, Desiccant Holder A941, and Check Valve A945. The desiccant holders are alternately placed on standby and dried by an automatic device which controls Solenoid Valve A938 and A939.

Pressure in the hydrocarbon and water vapor removal desiccant holders is indicated by Pressure Gages A930, A935, A940, and A943. Gaseous nitrogen flows from the water vapor removal unit, past Pressure Gage A1251, through a 20-micron Filter A1252. Differential Pressure Switch A1243 monitors the pressure differential across the filter and actuates at 50 psid to indicate a need to replace the 20-micron filter.

Pressure Regulator A1253 opens when supply pressure reaches 3500 psig. The regulator is fully open when downstream pressure matches the maximum pump discharge pressure of 6000 psig. Manual Valve A1246 is opened and GN_2 at 6000 psig flows past Relief Valve A1247 and Pressure Gage A1254 and then flows through Flowmeter A1249. Pressure Transducer A1248 and Temperature Transducer A1255 are used to convert the flowmeter readings to scfm.

Gaseous nitrogen flow continues through Manual Valve A1298, Filter A1303, and Check Valve A1300 (figure 3-3) to a manifold which serves both as a duct for filling or replenishing the GN_2 storage battery and as a discharge manifold. Relief Valve A1304 operates at 6400 (±100) psig to protect the input lines against overpressurization. Pressure Gage A1297 indicates input pressure from the GN_2 supply; Pressure Gage A1302 indicates input pressure to the manifold. Differential Pressure Switch A1299 actuates at 50 psid to indicate the need for replacing Filter A1303. Manifold pressure is indicated by Pressure Transducer A1274 and by Pressure Gages A906 and A1280. Manifold temperature is indicated by Temperature Transducer A1273. Overpressure protection for the manifold is provided by 6400 psig Relief Valves A1277, A845, and A880. The manifold supplies GN_2 to the propellant pneumatic control panels and the PCD.

During filling or replenishing operations, GN_2 supplied to the manifold enters each pair of storage tanks in the GN_2 storage battery through the respective manual valve (A1272 for Storage Tanks A1260 and A858). Storage tank inlet and drain manifold pressure is indicated by Pressure Gages A1269 and A1259 on Storage Tanks A1260 and A858 and by corresponding gages on the other pairs of tanks. Relief Valves A1270, A859, A898, A883, A876, and A848 vent excess GN_2 at 6400 (±100) psig.

When pressure in the GN_2 storage tanks reaches 6000 psig, Manual Valves A916, A913, and A1278 are opened. Gaseous nitrogen flows from the storage tanks through three lines to the pneumatic control distributor. Pressure in the GN_2 manifold lines is indicated by Pressure Gages A918, A915 and A1279.

A single line from the GN_2 manifold supplies the propellant system pneumatic control panels. Manual Valve A1268 is opened and GN_2 flows past Pressure Gage A1261 to Pressure Regulator A1267 where line pressure is reduced from 6000 to 3500 psig. Manual Valve A1264 is kept closed until line pressure builds up to 3500 psig as indicated by Pressure Gage A821. Relief Valve A1263 relieves line pressure in excess of 3750 psig into the GN_2 vent line. When line pressure reaches 3500 psig, the manual valves are opened and GN_2 flows past Pressure Gage A1262 to the propellant pneumatic control panels.

When the pneumatic control distributor and the propellant pneumatic control panel requirements have been met, supply line Manual Valves A1264, A1268, A1278, A913, and A916 are closed.

Pumps A1138, A1108 and A1093 (figure 3-1) and Vaporizers A1132, A1123, and A1084 are manually shut down when GN_2 storage battery pressure exceeds 6000 psig.

When the pumping units are completely shut down, the LN_2 transfer line Manual Valve A1164 and the LN_2 storage tank pressurization system Manual Valve A1161 are closed. Liquid nitrogen storage tank ullage pressure may be vented by opening Manual Valve A1186.

After the pumping units are shut down, all LN_2 transfer lines and associated equipment are drained. The LN_2 transfer line is drained by opening Manual Valve A1183. All manual vent valves (A1144, A1146, A1115, A1110, A1100, A1095, A1201, and A1206) on the converters that have been exposed to LN_2 are opened. All drained LN_2 flows into a common vent line and is exhausted to the atmosphere through Check Valve A1198.

The GN_2 transfer lines, storage tanks, and associated equipment are vented as required to provide the ambient pressure environment necessary for making repairs. The vaporizer discharge line may be vented to atmosphere through Check Valve A1386 by opening Manual Valve A1237. The GN_2 purification unit discharge line may be vented through Manual Valves A1245, A926, and A1256, and Check Valves A1244, A925, and A1390 to the vent line and the atmosphere. The entire GN_2 storage facility, or any portion, may be vented by opening applicable Manual Valve A1305 (see figure 3-3), A909, A1275, A908, A1258, A867, A893, A890, A870, and A855 so that GN_2 may pass through Check Valves A1306, A904, A1276, A907, A1257, A868, A892, A891, A869, and A856 to the vent line. The propellant pneumatic control panel supply line may be vented through Manual Valve A1266 and Check Valve A1265 to the vent line.

1.4 HELIUM STORAGE FACILITY COMPONENT DESCRIPTION

The majority of helium storage facility components are adequately described in section 2. Several of the more complex components are described in detail in following paragraphs.

1.4.1 Helium Compressor - The three helium compressors utilized in this system are four-stage, eight-cylinder, horizontal-mounted, reciprocating-piston type and are driven by a 100-hp, 440-volt, 3-phase AC motor. The compressor features forced air cooling and is electropneumatically controlled. The output capacity of each compressor is 150 scfm at 6000 psig with an input of 120 psig. A rupture disc that bursts at 11,000 psig is included for safety.

1.4.2 Helium Storage Battery - The helium storage battery is made up of four pairs of storage tanks each of which has input and drain manual valves, a relief valve, input and drain pressure gages, and a check valve in the vent line. The four pairs of tanks feed to a common manifold which is used to fill and replenish the tanks and to distribute the helium during vehicle launch.

1.4.3 Helium Control Devices - Three different groups of control devices are used in the helium system. These three groups are described as follows:

a. Pressure Regulators A1365, A1003, and A987 (figure 3-2) reduce the helium supply pressure from 2200 psig to 120 psig to meet the inlet pressure

requirements of Compressors A1051, A1024, and A979. The regulators are manually adjusted and remain open during transfer operations until the downstream pressure rises to 120 psig. The regulators then maintain a 120-psig flow.

b. Pneumatically operated Pressure Regulators A1320, A1039, and A964 increase filtering efficiency of the purification section of each helium compressor unit by preventing flow until the pressure reaches 3500 psig. The pressure regulators remain closed until pressure upstream in the purification section increases to 3500 psig. Each regulator then opens gradually with increasing pressure and is fully open when pressure has built up to 6000 psig on both sides of the regulator. The regulator is provided with 120 psig reference pressure from the inlet side of the compressor unit.

c. Pressure Regulator A1333 increases filtering efficiency of the helium purification system by preventing flow until the pressure is 3500 psig. The regulator remains closed until pressure in the purification system increases to 3500 psig. The regulator then opens gradually with increasing pressure and is fully open when pressure has built up to 6000 psig on both sides of the regulator. The regulator is dome loaded and is calibrated by manually adjusting a hand valve in the dome loading line.

1.5 HELIUM STORAGE FACILITY OPERATION

The helium storage facility receives a supply of gaseous helium from tube-bank trailers. The helium is transferred from the trailers to the three compressor units. High-pressure helium is then routed through a purification system into the storage battery. The storage battery delivers purified helium to the pneumatic control distributor. In normal operation, two compressor units function while the third unit remains on standby.

Since the three helium compressor systems are identical only the operation of Compressor A1024 is presented. Compressors A1051 and A979 are operated in a like manner.

1.5.1 Helium Transfer to the Helium Storage Facility - Gaseous helium is transferred at 2200 psig from tube-bank trailers, reduced to 120 psig, and is then fed to compressor units and compressed to 6000 psig. The compressed helium flows from the compressors through the purification system to the helium storage battery.

1.5.1.1 Preparation. Prior to transferring helium to the tanks in the storage battery, the following preparations are required.

a. Helium storage battery pressure gage Manual Valves A796, A794, A822, A797, A832, A830, A812, A815, A806, A802, A836, and A839 (figure 3-3) are opened.

b. Helium storage battery venting Manual Valves A1307, A825, A1287, A1313, A810, A807 and A834 are closed.

c. Helium supply manifold vent Manual Valves A1359 (figure 3-2), helium compressor unit Manual Valves A1001, A1354, A1043, and A1317, helium purification unit Manual Valves A1329, A1348, and A1070, and purification unit discharge line Manual Valves A1342, A1340, A1385, and A793 are closed.

d. Compressor unit Manual Valves A1020, A1019, and A1036 are closed.

e. Helium facility Manual Valves A993, A1362, and A997 are closed prior to attaching fill lines from the tube-bank trailer to Couplings A991, A1363, and A995.

f. Compressor unit Manual Valves A1002, A1032, A1037, and A1042 are opened.

g. Manual Valves A983, A946, A967, A959, A989, A988, A971, A966, and A960 are closed placing Compressor A979 on standby.

h. Either Manual Valves A1350 and A1346 are opened to place Desiccant Holders A1349, A1059, A1060, and A1061 in service, or Manual Valves A1063 and A1065 are opened to place Desiccant Holders A1066, A1067, A1068 and A1069 in service.

i. Pressure Regulator A1333 is adjusted for a cracking pressure of 3500 psig and Manual Valve A1334 is closed to prevent flow to the helium storage battery in the event of a regulator malfunction.

j. Helium storage battery Manual Valve A1295 (figure 3-3) and helium storage tank Manual Valves A826, A819, A798 and A1283 are opened.

k. Discharge line Manual Valves A1382, and A922 are closed.

1.5.1.2 Transfer. Helium Compressor A1024 (figure 3-2) is started by Motor A1023 and Solenoid Valve A1022 is automatically opened.

Manual Valves A993, A1362, and A997 are opened and helium flows from the tube-bank trailer through Couplings A991, A1363, and A995 and Check Valves A994, A1361, and A998. Supply line pressure is indicated by Pressure Gages A992, A1364, A996, A1356, and A999.

The helium then passes through Filter A1358 to the supply manifold. Differential pressure across the filter is monitored by Differential Pressure Switch A1393. Relief Valve A1357 relieves manifold pressure in excess of 2800 psig. Normal manifold pressure is 2200 psig.

Helium in the supply manifold flows through the compressor Manual Valve A1002 and Pressure Regulator A1003 to the pressure induction lines. Pump inlet pressure is

indicated by Pressure Gage A1004. Helium enters inlet Trap A1021 and flows through Solenoid Valve A1022 into Compressor A1024.

As compressor pressure builds up, Unloader A1015 is actuated momentarily by Solenoid Valve A1014 to vent oil and moisture present in Traps A1012, A1026, A1009 and A1029 and to purge air from Compressor A1024.

First, second, and third stage Intercoolers A1013, A1025 and A1010, and Aftercooler A1028 on Compressor A1024 remove the compression heat from the helium gas and maintain temperature within plus or minus 20 F of ambient. Intercooler Traps A1012, A1026, and A1009, and Aftercooler Trap A1029 remove oil and water present in the gaseous helium. Overpressure protection for the first, second, and third stage traps is provided by Relief Valves A1404, A1406 and A1408 which vent helium in excess of 435 psig, 1400 psig, and 4300 psig, respectively, to the atmosphere.

Pressure Gages A1011, A1027, A1008, and A1031 provide indications of first, second, third, and fourth stage discharge pressure on Compressor A1024.

Crankcase blowby helium from Compressor A1024 passes through Check Valve A1016, Precooler A1017, Precooler Trap A1018, and returns to inlet Trap A1021 for reinduction to the compressor. Oil and moisture present in the precooler trap is periodically vented to the atmosphere by opening Manual Valve A1019.

Helium discharging from the compressor at 6000 psig passes through Aftercooler Trap A1029 and Check Valve A1398 to the compressor unit purification section. Pressure Switch A1030 will automatically shut down Compressor A1024 if the discharge pressure exceeds 6400 psig.

Helium enters the compressor purification section through Manual Valve A1032 and passes through Mechanical Separator A1033, Desiccant Holders A1034 and A1401, and Filter A1035. The separator, desiccant holders, and filter remove oil, water, water vapor, and foreign matter from the helium. Helium leaves the purification section through Manual Valve A1037. Each helium compressor unit is capable of being shut down independently of the other as required to service the purification equipment. To service the purification section associated with compressor A1024, first shut the compressor down and open Manual Valve A1036, then open the drain valve on Mechanical Separator A1033. Replace cartridges in the desiccant holders and dry the filter as required. Standby compressor A979 must be started before either of the operational compressors is shut down.

Compressed helium passes through Pressure Regulator A1039 which prevents flow at pressure below 3500 psig. As the storage battery is charged, discharge pressure builds up to 6000 psig. Storage battery pressure is indicated by Pressure Gage A1040. Pressure Gage A1007 indicates the regulator control pressure.

Helium leaves the compressor unit through Manual Valve A1042 and Check Valve A1041 and enters the inlet line to the helium purification system.

Relief Valves A1326 and A1327, preset to relieve at 6450 psig, provide overpressure protection for the discharge line. Pressure Gages A1330, A1388, and A1064 indicate helium purification system inlet pressure.

Helium from the compressor unit passes through Check Valve A1351, Manual Valve A1350, and Desiccant Holders A1349, A1059, A1060, and A1061 or through Check Valve A1351, Manual Valve A1063, and Desiccant Holders A1066, A1067, A1068, and A1069 to the purification system. The desiccant banks are alternately isolated and recharged as required with clean desiccant cartridges. A low pressure environment for replacement of cartridges is provided by venting helium to the vent line through Manual Valve A1070 and Check Valve A1071, or through Manual Valve A1348 and Check Valve A1347.

Helium leaves the purification system through Manual Valve A1346 or Manual Valve A1065 and enters the discharge line.

Helium flows past Pressure Gage A1331, through 20-micron Filter A1332 to Pressure Regulator A1333. Differential pressure across the filter is monitored by Differential Pressure Switch A1394. Pressure Regulator A1333 prevents flow until a back pressure of 3500 psig is reached. Manual Valve A1334 is then opened and helium flows to the storage battery. As downstream pressure increases above 3500 psig, the regulator opens and line pressure rises to the normal delivery pressure of 6000 psig.

Pressure Gage A1335 indicates line pressure downstream from Manual Valve A1334, and Relief Valve A1339 vents excess helium to the vent line at 6400 psig. Flowmeter A1337 indicates line flow rate. Measurements taken from Temperature Transducer A1336 and Pressure Transducer A1338 are used to convert the flowmeter readings to scfm. The normal flow rate is 150 scfm per compressor.

Helium flows through the transfer line (figure 3-3) past Pressure Gage A1296 and Relief Valve A1310 through Manual Valve A1295 into the helium storage battery. The flow continues through Filter A1309 and Check Valve A1293 past Pressure Gage A1291 into the helium storage tank supply manifold. Differential pressure across Filter A1309 is monitored by Differential Pressure Switch A1294.

The helium inlet line discharges into a duct that serves as a manifold for filling and replenishing the storage tanks. The duct also serves as a discharge manifold for the storage tanks. Manifold pressure is indicated by Pressure Gages A823 and A1288, and by Pressure Transducer A1290. Manifold temperature is indicated by Temperature Transducer A1289. Relief Valves A820 and A1285 vent pressure in excess of 6400 psig into the vent line.

During filling or replenishing operations, helium supplied to the manifold enters the four pairs of storage tanks through Manual Valves A826, A819, A798 and A1283. Inlet manifold and tank pressure is monitored by Pressure Gages A829 and A1312, A816 and A811, A801 and A805, and A1281 and A835. Relief Valves A828, A817, A820, A1285, A800, and A1284 vent at 6400 (±100) psig.

The two operating helium compressors are shut down when supply requirements have been met.

The helium compressors and the storage facility are not vented during or after the operating sequence. Venting is a procedure used only to provide the low-pressure environment required for system repairs. The helium supply line and manifold may be vented through Manual Valves A1359 (figure 3-2), A989, A1001, and A1354, and Check Valves A1360, A990, A1000, and A1355, respectively.

Compressor discharge lines that contain pressurized helium may be vented through Manual Valves A959, A1043, A1317, and A1329, and Check Valves A958, A1044, A1318, and A1328, respectively. The helium purification unit may be vented through Manual Valves A1070 and A1348, and Check Valves A1071 and A1347 when the desiccant holders are being recharged. The purification system discharge line may be vented through Manual Valves A1342, A1340, and A1385, and Check Valves A1343, A1341, and A1384, respectively. The storage battery inlet and discharge manifold (figure 3-3) may be vented through Manual Valves A1307, A825, and A1287, and Check Valves A1308, A824, and A1286 into the vent line. The storage tanks may be vented through Manual Valves A1313, A810, A807, and A834, and Check Valves A1314, A809, A808, and A833, respectively.

1.5.2 Helium Transfer to the Pneumatic Control Distributor - Helium is transferred from the storage battery to the PCD (figure 3-3) through two transfer lines.

1.5.2.1 Preparation. Prior to transferring helium to the pneumatic control distributor, the following preparations are required:

a. Pressure gage Manual Valves A771 and A923 are opened.

b. Manual Valves A922 and A1382 already closed for the storage battery charging sequence, remain closed.

1.5.2.2 Transfer. When helium storage battery pressure reaches 6000 psig, Manual Valves A932 and A1382 are opened, permitting helium to flow into both transfer lines. Helium at 6000 psig flows through the transfer lines to the PCD. Line pressure is indicated by Pressure Gages A1383 and A924.

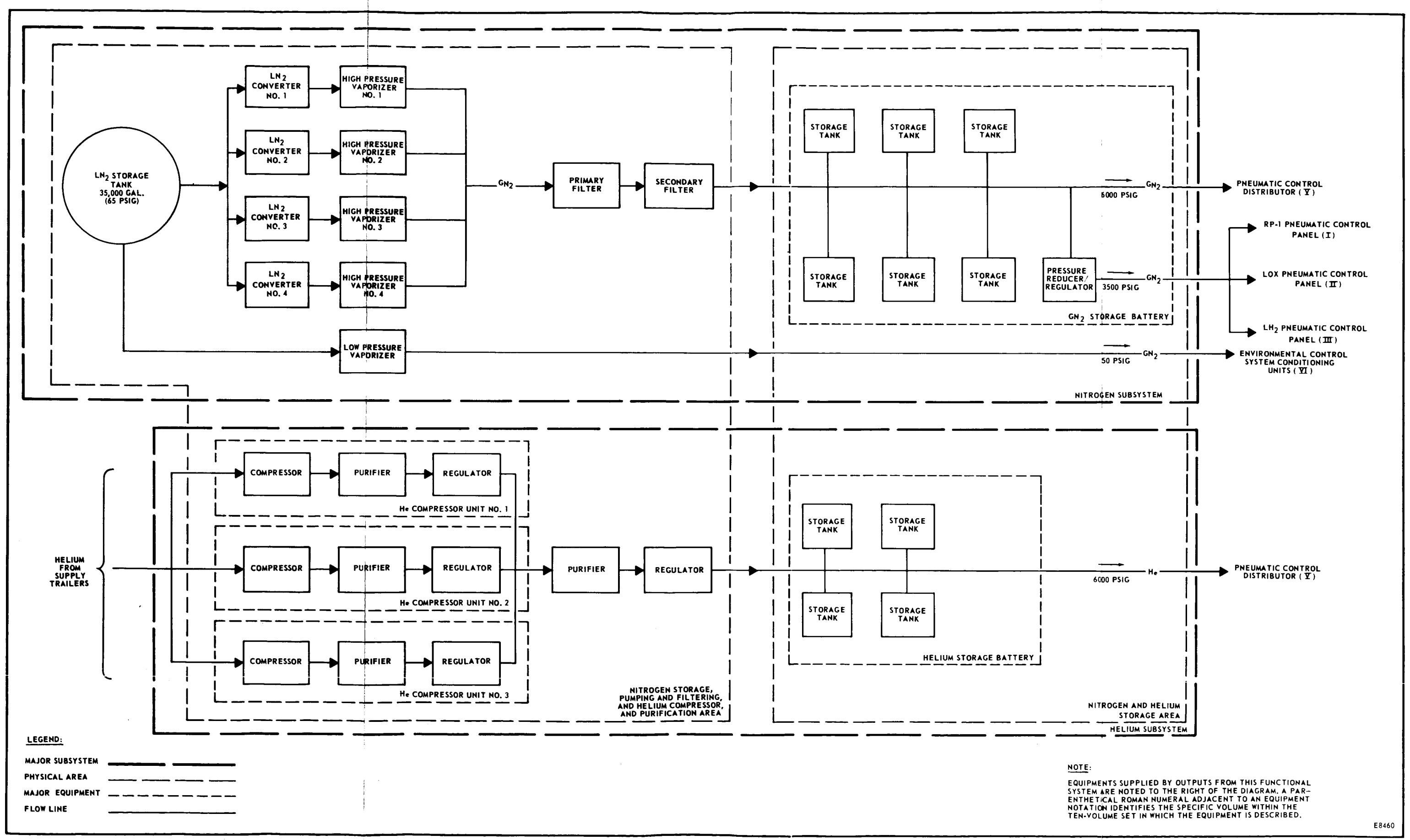


Figure 1-1. Nitrogen and Helium Storage Facility - Block Diagram

SECTION 2

INDEX OF FINDING NUMBERS

This section contains an alpha-numeric list, by finding number, of the nitrogen and helium storage facility components that function during a prelaunch countdown. The finding numbers listed identify components on system schematic diagrams provided in section 3. Additional columns in the index of finding numbers provide such pertinent information as component description and function, part number, and the supplier's name and part number. A break will occur in the alpha-numeric sequence of finding numbers when a component, or component series is non-functional during the countdown, functional only in the event of a malfunction, functional in terms of a maintenance operation only, or is part of another functional system.

The letter prefix of a finding number identifies the component with respect to either the launch complex or an area of the launch vehicle. The letter prefixes used in this eleven-volume set are listed below.

FINDING NUMBER PREFIX	DESIGNATED AREA
A	Launch Complex
B	S-I stage
E	S-IV stage
G	Instrument unit
H	Payload

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A771	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A772	1	Converter, LN_2		Cosmodyne Part of P/N 3100900	Part of 10428625	
A773 through A784 are not functionally applicable to this system.						
A785	1	Vaporizer	6000 psig, 1000 scfm	Cosmodyne P/N 241000	Part of 10428625	
A786 through A792 are not functionally applicable to this system.						
A793	1	Valve, Manual	drain			
A794	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6D-401B-2M	10428535	
A795 is not functionally applicable to this system.						
A796	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A797	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A798	1	Valve, Manual	1-1/2 in., shutoff	Vacco P/N M-6P-X467-2G	10428531	
A799 is not functionally applicable to this system.						

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A800	1	Valve, Relief	1 in.; relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A801	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A802	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-501B-2M	10428535	
A803	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A804	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A805	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A806	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A807	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A808	1	Valve, Check	3/4 in.; spring-loaded poppet type	Vacco P/N CVL-6P-X464	10428538	
A809	1	Valve, Check	3/4 in.; spring-loaded poppet type	Vacco P/N CVL-6P-X464	10428538	
A810	1	Valve, Manual	3/4 in., drain	Vacco P/N M-6P-X464-2G	10428533	
A811	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A812	1	Valve, Manual	1/4 in., shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A813	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A814	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A815	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A816	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A817	1	Valve, Relief	1 in., relieves at 6400 (± 100) psig	Ladewig Valve Co. P/N N-1072	10428540	
A818 is not functionally applicable to this system.						
A819	1	Valve, Manual	1-1/2 in., shutoff storage tank fill	Vacco P/N M-6P-X467-2G	10428531	
A820	1	Valve, Relief	1 in.; relieves at 6400 (± 100) psig	Ladewig Valve Co. P/N N-1072	10428540	
A821	1	Gage, Pressure	0 to 5000 psig range; 3500 psig normal indication	Helicoid P/N 3341	10428545	
A822	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-401B-2M	10428535	
A823	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A824	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A825	1	Valve, Manual	1 1/2 in., shutoff	Vacco P/N MA-6P-X463-2G	10428534	
A826	1	Valve, Manual	1 1/2 in., shutoff, He tank fill	Vacco P/N M-X467-2G	10428531	
A827 is not functionally applicable to this system.						
A828	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A829	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A830	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A831	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A832	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A833	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428538	
A834	1	Valve, Manual	3/4 in., drain	Vacco P/N M-6P-X464-2G	10428533	
A835	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A836	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A837	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A838	1	Tank, Storage	6000 psig helium storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A839	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A840 is not functionally applicable to this system.						
A841	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A842	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A843	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A844	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A845	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158XSFF	10428540	
A846	1	Valve, Manual	1 1/2 in., shutoff, GN_2 Storage tank fill	Vacco P/N M-6P-X467-2G	10428531	
A847 is not functionally applicable to this system.						

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A848	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A849	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A850	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A851	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A852	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A853	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A854	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A855	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A856	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428533	
A857	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A858	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A859	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A860 is not functionally applicable to the system.						
A861	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A862	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A863	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A864	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A865	1	Gage, Pressure	0 to 10,000 psig range; 6,000 psig normal indication	Helicoid P/N 3341	10428544	
A866	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-401B-2M	10428535	
A867	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A868	1	Valve, Check	3/4 in.	Vacco P/N M-6P-X464-2G	10428538	
A869	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428538	
A870	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A871	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A872	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N MV-6P-401B-2M	10428621	
A873	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A874	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MU50717A	10428621	
A875 is not functionally applicable to this system.						
A876	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A877	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A878	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A879	1	Valve, Manual	1-1/2 in., shutoff, GN_2 tank fill	Vacco P/N M-6P-X407-2G	10428531	
A880	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A881	1	Valve, Manual	1-1/2 in., shutoff, GN_2 tank fill	Vacco P/N M-6P-X467-2G	10428531	
A882 is not functionally applicable to this system.						
A883	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A884	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A885	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-401B-2M	10428621	
A886	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A887	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A888	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A889	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A890	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A891	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428538	
A892	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428538	
A893	1	Valve, Manual	3/4 in., vent	Vacco P/N M-6P-X464-2G	10428533	
A894	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indicated	Helicoid P/N 3341	10428544	
A895	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A896	1	Tank, Storage	6000 psig GN_2 storage; 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A897	1	Tank, Storage	6000 psig GN_2 storage; 200 cu. ft. capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A898	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A899 is not functionally applicable to this system.						
A900	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A901	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	104238544	
A902	1	Valve, Manual	1-1/2 in., shutoff, GN_2 tank fill	Vacco P/N M-6P-X467-2G	10428531	
A903	1	Valve, Manual	1-1/2 in., shutoff GN_2 tank fill	Vacco P/N M-6P-X467-2G	10428531	
A904	1	Valve, Check	1/2 in., cracking pressure 5 psig maximum	Security Valve Co. P/N A1127-1	10423539	
A905	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A906	1	Gage, Pressure	0 to 10,000 psig range 6000 psig normal indication	Helicoid P/N 3341	10428544	
A907	1	Valve, Check	1/2 in., cracking pressure 5 psig maximum	Security Valve Co. P/N A1127-1	10428439	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A908	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A909	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A910	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10438535	
A911 is not functionally applicable to this system.						
A912	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A913	1	Valve, Manual	2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	
A914	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A915	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N M-6P-X469-2G	10428544	
A916	1	Valve, Manual	2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	
A917	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428835	
A918	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A919 is not functionally applicable to this system.						

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A920	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A921 is not functionally applicable to this system.						
A922	1	Valve, Manual	2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	
A923	1	Valve, Manual	1/4 in., gage shutoff	Vacco P/N NV-6P-401B-2M	10428535	
A924	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A925	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A926	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A927	1	Valve, Manual	NC, drain			
A928	1	Valve, Manual	Shutoff		Part of 10428600	
A929	1	Valve, Manual	Shutoff		Part of 10428600	
A930	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication		Part of 10428600	
A931	1	Desiccant Holder	Hydrocarbon removal, 10 microns		Part of 10428600	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A932	1	Valve, Manual	Drain		Part of 10428600	
A933	1	Valve, Manual	Drain		Part of 10428600	
A934	1	Desiccant Holder	Hydrocarbon removal, 10 microns		Part of 10428600	
A935	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication		Part of 10428600	
A936	1	Valve, Check			Part of 10428600	
A937	1	Valve, Check			Part of 10428600	
A938	1	Valve, Solenoid	NC		Part of 10428601	
A939	1	Valve, Solenoid	NC		Part of 10428601	
A940	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication		Part of 10428601	
A941	1	Desiccant, Holder	Water vapor removal, 10 micron nominal, 0.05 min	The Pall Co.	Part of 10428601	
A942	1	Desiccant, Holder	Water vapor removal, 10 micron nominal, 0.05 min	The Pall Co.	Part of 10428601	
A943	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication		Part of 10428601	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A944	1	Valve, Check			Part of 10428601	
A945	1	Valve, Check			Part of 10428601	
A946	1	Valve, Manual	1/4 in., vent	Cardair P/N A1-15812	Part of 10428623	
A947	1	Trap		Cardair P/N AS-30856	Part of 10428623	
A948	1	Heat Exchanger	1 in. coil, blow-by	Cardair	Part of 10428623	
A949	1	Valve, Check		Stock No. 16133 Cardair	Part of 10428623	
A950	1	Valve, Solenoid	NC	Cardair P/N AS-15572	Part of 10428623	
A951	1	Unloader		Cardair P/N AC-45548-G2	Part of 10428623	
A952	1	Heat Exchanger	1 in. coil, 1st stage	Cardair	Part of 10428623	
A953	1	Trap		Cardair P/N AC-45988	Part of 10428623	
A954	1	Gage, Pressure	0 to 800 psig range	P/N AS-45300	Part of 10428623	
A955	1	Heat Exchanger	1/2 in. coil, 3rd stage	Cardair	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A956	1	Trap		Cardair P/N AC-45990	Part of 10428623	
A957	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cardair P/N AS-45302	Part of 10428623	
A958	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A959	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A960	1	Valve, Manual	3/4 in., shutoff	Vacco P/N M-6P-X464-2G	10428533	
A961	1	Valve, Check	3/8 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428549	
A962	1	Gage, Pressure	0 to 300 psig range; 120 psig normal indication	Cardair P/N AS-45299	Part of 10428623	
A963	1	Gage, Pressure	0 to 16,000 psig range; 6000 psig normal indication	Cardair P/N AS-45406	Part of 10428623	
A964	1	Regulator, Pressure	Cracks at 3500 psig; fully open at 6000 psig	Cardair P/N 35100041	Part of 10428623	
A965 is not functionally applicable to this system.						
A966	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A967	1	Valve, Manual	3/4 in., vent	Cardair P/N AS-30700	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A968	1	Filter	7 to 10 microns	Cardair P/N AC-46203	Part of 10428623	
A969	1	Desiccant Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A970	1	Separator, Mechanical	Water and oil removal	Cardair P/N AS-45984	Part of 10428623	
A971	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A972	1	Gage, Pressure	0 to 16,000 psig range; 6000 psig normal indication	Cardair P/N 45406	Part of 10428623	
A973	1	Switch, Pressure	Actuates at 6400 psig	Cardair P/N AS-45299	Part of 10428623	
A974	1	Trap		Cardair P/N AC-45991	Part of 10428623	
A975	1	Heat Exchanger	3/4 in., coil, 4th stage	Cardair	Part of 10428623	
A976	1	Gage, Pressure	0 to 3000 psig range	Cardair P/N AS-45301	Part of 10428623	
A977	1	Trap	Interstage oil	Cardair P/N AC-45989	Part of 10428623	
A978	1	Heat Exchanger	3/4 in., 2nd stage	Cardair	Part of 10428623	
A979	1	Compressor, Helium	120 to 6000 psig, 150 scfm, four-stage	Cardair P/N AE-45980	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A980	1	Motor,	100 hp	Cardair P/N 71700210	Part of 10428623	
A981	1	Valve, Solenoid	1-1/2 in., NC	Cardair P/N AS-46000	Part of 10428623	
A982	1	Trap		Cardair P/N AD-45970	Part of 10428623	
A983	1	Valve, Manual	1/4 in., NC, vent	Cardair P/N AC-15812	Part of 10428623	
A984 and A985 are not functionally applicable to this system.						
A986	1	Gage, Pressure	0 to 300 psig range; 120 psig normal indication	Cardair P/N AS-46002	Part of 10428623	
A987	1	Regulator, Pressure	2200 to 120 psig pressure reduction	Cardair P/N AS-46359	Part of 10428623	
A988	1	Valve, Manual	3/4 in., shutoff	Vacco P/N MA-6P-464-2G	10428552	
A989	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A990	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10420598	
A991	1	Coupling, Quick Disconnect		AN815-8C		
A992	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Helicoid P/N 3341	10428545	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A993	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X465-2G	10428532	
A994	1	Valve, Check	1 in.	Vacco P/N CVL-6P-X465	10428546	
A995	1	Coupling, Quick Disconnect		AN815-8C		
A996	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Helicoid P/N 3341	10428545	
A997	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X465-2G	10428532	
A998	1	Valve, Check	1 in.	Vacco P/N CVL-6P-X465	10428546	
A999	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Helicoid P/N 3341	10428545	
A1000	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1001	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1002	1	Valve, Manual	3/4 in., shutoff	Vacco P/N MA-6P-464-2G	10428552	
A1003	1	Regulator, Pressure	2200 to 120 psig pressure reduction	Cardair P/N AS-46359	Part of 10428623	
A1004	1	Gage, Pressure	0 to 300 psig range; 120 psig normal indication	Cardair P/N AS-46002	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1005 and A1006 are not functionally applicable to this system.						
A1007	1	Gage, Pressure	0 to 300 psig range; 120 psig normal indication	Cardair P/N AS-45299	Part of 10428623	
A1008	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cardair P/N AS-45302	Part of 10428623	
A1009	1	Trap		Cardair P/N AC-45990	Part of 10428623	
A1010	1	Heat Exchanger	1/2 in., coil, 3rd stage	Cardair	Part of 10428623	
A1011	1	Gage, Pressure	0 to 800 psig range	Cardair P/N AS045300	Part of 10428623	
A1012	1	Trap		Cardair P/N AC-45988	Part of 10428623	
A1013	1	Heat Exchanger	1 in., coil, 1st stage	Cardair	Part of 10428623	
A1014	1	Valve, Solenoid	NC	Cardair P/N AS-15572	Part of 10428623	
A1015	1	Unloader		Cardair P/N AC-45548-G2	Part of 10428623	
A1016	1	Valve, Check		Cardair P/N 16133	Part of 10428623	
A1017	1	Heat Exchanger	1 in., coil, blow-by	Cardair	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1018	1	Trap		Cardair P/N AS-30856	Part of 10428623	
A1019	1	Valve, Manual	1/4 in., vent	Cardair P/N AC-15812	Part of 10428623	
A1020	1	Valve, Manual	1/4 in., vent	Cardair P/N AC-15812	Part of 10428623	
A1021	1	Trap		Cardair P/N AD-45970	Part of 10428623	
A1022	1	Valve, Solenoid	NC	Cardair P/N AS-46000	Part of 10428623	
A1023	1	Motor	100 hp	Cardair P/N 71700210	Part of 10428623	
A1024	1	Compressor	120 to 6000 psig, 150 scfm, four-stage	Cardair P/N AE-45980	Part of 10428623	
A1025	1	Heat Exchanger	3/4 in., coil, 2nd stage	Cardair	Part of 10428623	
A1026	1	Trap		Cardair P/N AC-45989	Part of 10428623	
A1027	1	Gage, Pressure	0 to 3000 psig range	Cardair P/N AS-45301	Part of 10428623	
A1028	1	Heat Exchanger	3/8 in., coil, 4th stage	Cardair	Part of 10428623	
A1029	1	Trap		Cardair P/N AC-45991	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1030	1	Switch, Pressure	Actuates at 6400 psig	Cardair P/N AS-45299	Part of 10428623	
A1031	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cardair P/N AS-45406	Part of 10428623	
A1032	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A1033	1	Separator, Mechanical	Water and oil removal	Cardair P/N AS-45964	Part of 10428623	
A1034	1	Desiccant Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A1035	1	Filter	7 to 10 microns	Cardair P/N AL-46203	Part of 10428623	
A1036	1	Valve, Manual	3/4 in., vent	Cardair P/N AS-30700	Part of 10428623	
A1037	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A1038 is not functionally applicable to this system.						
A1039	1	Regulator, Pressure	Cracks at 3500 psig; fully open at 6000 psig	Cardair P/N 35100041	Part of 10428623	
A1040	1	Gage, Pressure	0 to 16,000 psig range; 6000 psig normal indication	Cardair P/N AS-45406	Part of 10428623	
A1041	1	Valve, Check	3/8 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428549	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1042	1	Valve, Manual	3/4 in., shutoff	Vacco P/N M-6P-X464-2G	10428533	
A1043	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1044	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1045 and A1046		are not functionally applicable to this system.				
A1047	1	Valve, Manual	1/4 in., vent	Cardair P/N AC-15812	Part of 10428623	
A1048	1	Trap		Cardair P/N AS-30856	Part of 10428623	
A1049	1	Heat Exchanger	1 in., coil, blow-by	Cardair	Part of 10428623	
A1050	1	Motor	100 hp	Cardair P/N 71700210	Part of 10428623	
A1051	1	Compressor	120 to 6000 psig, 150 scfm, four-stage	Cardair P/N AE-45980	Part of 10428623	
A1052	1	Heat Exchanger	1 in., coil, 1st stage	Cardair	Part of 10428623	
A1053	1	Trap		Cardair P/N AC-45988	Part of 10428623	
A1054	1	Gage, Pressure	0 to 800 psig range	Cardair P/N AS-45300	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1055	1	Heat Exchanger	1/2 in., coil, 3rd stage	Cardair	Part of 10428623	
A1056	1	Trap		Cardair P/N AC-45990	Part of 10428623	
A1057	1	Gage, Pressure	0 to 10,000 psig range	Cardair P/N AS-45302	Part of 10428623	
A1058	1	Desiccant Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A1059	1	Desiccant Holder	Water and oil removal, 0.3 micron min	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	
A1060	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	
A1061	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-813-3-773	10428557	
A1062 is not functionally applicable to this system.						
A1063	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X466-2G	10428556	
A1064	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1065	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X466-2G	10428556	
A1066	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1067	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	
A1068	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3773	10428557	
A1069	1	Desiccant Holder	Water and oil removal, 0.3 micron min.	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	
A1070	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1071	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1072	1	Vaporizer	200 gpm	Cosmodyne	10428622	
A1073	1	Valve, Manual	3 in., shutoff	Powell Co.	10428562	
A1074	1	Valve, Manual	1-1/2 in., shutoff	Powell Co.	10428564	
A1075	1	Converter, LN_2		Cosmodyne Part of PN 3100900	Part of 10428625	
A1076 through A1078 are not functionally applicable to this system.						
A1079	1	Motor	50 hp	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1080	1	Switch, Temperature	Actuates at 0 F; -75 F to + 225 F range	Cosmodyne Part of P/N 2410000	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1081	1	Valve, Check		Cosmodyne Part of P/N 2410000	Part of 10418625	
A1082	1	Valve, Manual	Shutoff	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1083	1	Valve, Relief	Relieves at 6800 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1084	1	Vaporizer	6000 psig, 1000 scfm	Cosmodyne Part of P/N 2410100	Part of 10428625	
A1085	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1086 through A1089 are not functionally applicable to this system.						
A1090	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1091	1	Switch, Pressure	Actuates at 6700 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1092	1	Motor	50 hp	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1093	1	Pump	6000 psig, 1000 scfm	Cosmodyne Part of P/N 3100900	Part of 10428625	
A1094	1	Valve, Relief	Relieves at 150 psig	Cosmodyne Part of P/N 2409800	Part of 10418625	
A1095	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1096	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1097	1	Valve, Relief	Relieves at 200 psig	Cosmodyne Partof P/N 2409800	Part of 10428625	
A1098	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1099	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1100	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1101	1	Valve, Manual	1-1/2 in., shutoff	Powell Co. P/N 43121	10428564	
A1102	1	Valve, Manual	1 in., drain	Powell Co. P/N 49008	10428560	
A1103	1	Valve, Manual	2 in., shutoff	Powell Co. P/N 40395	10428561	
A1104	1	Valve, Relief	1 in., relieves at 150 ($\pm$ 10.5) psig	C. M. Bailey Co. P/N 119-1	10428568	
A1105	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1106	1	Switch, Pressure	Actuates at 6700 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1107	1	Motor	50 hp	Cosmodyne Part of P/N 2409800	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1108	1	Pump	6000 psig, 1000 scfm	Cosmodyne Part of P/N 3100900	Part of 10428625	
A1109	1	Valve, Relief	Relieves at 150 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1110	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1111	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1112	1	Valve, Relief	Relieves at 200 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1113	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1114	1	Valve, Manual	1-1/2 in. shutoff	Powell Co. P/N 43121	10428564	
A1115	1	Valve, Manual	Drain	Cosmodyne Part of P/N 2409800	Part of 10418625	
A1116	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1117	1	Converter, LN_2		Cosmodyne Part of P/N 3100900	Part of 10428625	
A1118 through A1121 are not functionally applicable to this system.						
A1122	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1123	1	Vaporizer	6000 psig, 1000 scfm	Cosmodyne P/N 2410100	Part of 10428625	
A1124	1	Valve, Relief	Relieves at 6800 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1125	1	Valve, Manual	Shutoff	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1126	1	Valve, Check		Cosmodyne Part of P/N 2410000	Part of 10428625	
A1127	1	Switch, Temperature	Actuates at 0 F; -75 F to + 225 F range	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1128	1	Switch, Temperature	Actuates at 0 F; -75 F to + 225 F range	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1129	1	Valve, Check		Cosmodyne Part of P/N 2410000	Part of 10428625	
A1130	1	Valve, Manual	Shutoff	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1131	1	Valve, Relief	Relieves at 6800 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1132	1	Vaporizer	6000 psig, 1000 scfm	Cosmodyne Part of P/N 2410100	Part of 10428625	
A1133	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1134 is not functionally applicable to this system.						

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1135	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1136	1	Switch, Pressure	Actuates at 6700 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1137	1	Motor	50 hp	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1138	1	Pump	6000 psig, 100 scfm	Cosmodyne Part of P/N 3100900	Part of 10428625	
A1139 through A1141 are not functionally applicable to this system.						
A1142	1	Converter, LN_2		Cosmodyne Part of P/N 3100900	Part of 10428625	
A1143	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1144	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1145	1	Valve, Relief	Relieves at 150 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1146	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1147	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1148	1	Valve, Relief	Relieves at 200 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1149	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1150	1	Tank, Storage	35,000 gallons capacity, LN_2	Pittsburg-Des Moines	10428624	
A1151 through A1156 are not functionally applicable to this system.						
A1157	1	Valve, Manual	Shutoff	Powell Co.	Part of 10428264	
A1158	1	Gage, Pressure	0 to 150 psig range; 65 psig normal indication		Part of 10428624	
A1159 and A1160 are not functionally applicable to this system.						
A1161	1	Valve, Manual	2 in., shutoff	Powell Co. P/N 70-376 F. E.	Part of 10428624	
A1162 and A1163 are not functionally applicable to this system.						
A1164	1	Valve, Manual	2 in., shutoff	Powell Co. P/N 70-376 F. E.	Part of 10428624	
A1165	1	Valve, Manual	3 in., shutoff	Powell Co. P/N 70-376 F. E.	Part of 10428624	
A1166 through A1174 are not functionally applicable to this system.						
A1175	1	Strainer	3 in.	Leslie P/N S1176F, Alt. 4	10428578	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1176	1	Strainer	2 in.	Leslie P/N S1176F, Alt. 4	10428565	
A1177	1	Valve, Relief	1 in., relieves at 150 (± 10.5) psig	C. M. Bailey Co. P/N 119-1	10428568	
A1178	1	Valve, Relief	1 in., relieves at 150 (± 10.5) psig	C. M. Bailey Co. P/N 119-1	10428568	
A1179	1	Valve, Manual	3 in., shutoff	Vacco P/N MO2T-F4610	10428577	
A1180	1	Gage, Pressure	0 to 300 psig range; 60 psig normal indication	Helicoid P/N 3341	10428599	
A1181	1	Valve, Relief	1 in., relieves at 150 (± 10.5) psig	C. M. Bailey Co. P/N 119-1	10428568	
A1182	1	Valve, Manual	1 in., drain	Powell P/N 49008	10428560	
A1183	1	Valve, Manual	1 in., drain	Powell P/N 49008	10428560	
A1184	1	Valve, Check	4 in.	Crane Co. P/N K-4795	10428572	
A1185	1	Regulator, Pressure	4 in., NC; fully closed at 10 psid, fully open at 15 psid	Annin Co. P/N Model 1560	10428603	
A1186	1	Valve, Manual	Bypass		Part of 10428624	
A1187	1	Valve, Manual	4 in., vent		Part of 10428624	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1188	1	Controller, Pneumatic	22 to 85 psig output, proportional to 25 to 100 psig input	Mason-Neilon P/N Model No. 2707	10428602	
A1189	1	Vaporizer	LN_2 tank ullage pressurization		10427318	
A1190	1	Regulator, Pressure	1 in., N.O.; fully open at 3 psid, fully closed at 9 psid	Annin Co., Model 1560	10428604	
A1191	1	Valve, Manual	1 in., bypass	Powell Co. P/N 39844	Part of 10428624	
A1192	1	Valve, Relief	Relieves at 150 psig	C.M. Bailey Co. P/N 119	Part of 10428624	
A1193 through A1197 are not functionally applicable to this system.						
A1198	1	Valve, Check	2 in.	Powell Co. P/N 41364	10428570	
A1199 and A1200 are not functionally applicable to this system.						
A1201	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1202	1	Valve, Manual	Vent	Cosmodyne P/N 2409800	Part of 10428625	
A1203	1	Gage, Pressure	0 to 100 psig range	Cosmodyne P/N 2409800	Part of 10428625	
A1204	1	Gage, Pressure	0 to 100 psig range	Cosmodyne Part of P/N 2409800	Part of 10428625	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1205	1	Valve, Relief	Relieves at 200 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1206	1	Valve, Manual	Pump blowby, throttling	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1207	1	Valve, Relief	Relieves at 150 psig	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1208	1	Pump	6000 psig, 1000 scfm	Cosmodyne Part of P/N 3100900	Part of 10428625	
A1209 through A1211 are not functionally applicable to this system.						
A1212	1	Valve, Manual	Vent	Cosmodyne Part of P/N 2409800	Part of 10428625	
A1213	1	Switch, Pressure	Actuates at 6700 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1214	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1215 and A1216 are not functionally applicable to this system.						
A1217	1	Valve, Relief	Relieves at 150 ($\pm$ 10.5) psig	C. M. Bailey Co. P/N 119-1	10428568	
A1218	1	Valve, Manual	2 in., shutoff	Powell Co. P/N 40395	10428561	
A1219	1	Valve, Manual	1-1/2 in., shutoff	Powell Co. P/N 43121	10428564	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1220	1	Valve, Manual	1 in., drain	Powell Co. P/N 49008	10428560	
A1221	1	Valve, Manual	3 in., shutoff	Powell Co. P/N 40402	10428562	
A1222 and A1223 are not functionally applicable to this system.						
A1224	1	Valve, Relief	Relieves at 6800 psig	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1225	1	Valve, Manual	Shutoff	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1226	1	Valve, Check		Cosmodyne Part of P/N 2410000	Part of 10428625	
A1227	1	Switch, Temperature	Actuates at 0 F; -75 to 225 F Range	Cosmodyne Part of P/N 2410000	Part of 10428625	
A1228 is not functionally applicable to this system.						
A1229	1	Vaporizer	200 gpm, Low pressure LN_2	Cosmodyne	Part of 10428622	
A1230 is not functionally applicable to this system.						
A1231	1	Valve, Relief	4 in., relieves at 125 ($\pm$ 10.5) psig	C. M. Bailey Co. P/N 122-4	10428579	
A1232	1	Valve, Manual	2 in., vent	Powell Co. P/N 23200	10428584	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1233	1	Transducer, Pressure	0 to 100 psig range	Fairchild Controls Corp P/N 990S50-2	10465306	
A1234	1	Transducer, Temperature	-100 F to + 250 F range	Aero Research P/N T-5215	10465310-3	
A1235	1	Flowmeter	9,000 to 12,000 scfm	Cox Inst. Co. Type 20 Model 192 SCRF	10465307	
A1236	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1237	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1238 is not functionally applicable to this system.						
A1239	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	
A1240 through A1242 are not functionally applicable to this system.						
A1243	1	Switch, Pressure	Actuates at 50 psid	Barksdale Valves P/N 9653-1-H-D		
A1244	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N33860-1	10428598	
A1245	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1246	1	Valve, Manual	2-1/2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1247	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1248	1	Transducer, Pressure	0 to 7000 psig range	Fairchild Controls Model 990S50-2	10465306	
A1249	1	Flowmeter	2000 to 8000 scfm range	Cox Inst. Co., Model 24 SCRF, Model 2-5318G Potter Aero Corp.	10465308	
A1250	1	Valve, Check	2-1/2 in.	Vacco P/N CLV-6P-X469	10428537	
A1251	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	
A1252	1	Filter	20 microns, 2-1/2 in.	Microporous Filter Div of Circle Seal P/N F 4297	10428543	
A1253	1	Regulator, Pressure	Cracks at 3500 psig; fully open at 6000 psig	Vacco P/N BPR-6P-X469-06	10428582	
A1254	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	
A1255	1	Transducer, Temperature	-100 F to + 250 F range	Aero Research P/N T-5215	10465310-1	
A1256	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-5P-X463-2G	10428534	
A1257	1	Valve, Check	3/4 in.	Vacco P/N M-6P-X464-2G	10428533	
A1258	1	Valve, Check	3/4 in., NC, vent	Vacco P/N M-6P-X464-2G	10428533	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1259	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1260	1	Tank, Storage	6000 psig GN_2 storage, 200 cu ft capacity	A. O. Smith Corp. P/N MV-50717 & MV-50717A	10428621	
A1261	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1262	1	Gage, Pressure	0 to 5000 psig range; 3500 psig normal indication	Helicoid P/N 3341	10428545	
A1263	1	Valve, Relief	Relieves at 375 (± 100) psig	Ladewig Co. P/N 158SFF	10428541	
A1264	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X465-2G	10428532	
A1265	1	Valve, Check	1/2 in. cracking pressure, 5 psig maximum	Security Valve Co. P/N A1127-1	10428539	
A1266	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1267	1	Regulator, Pressure	6000 to 3500 psig pressure reduction	Vacco P/N DL6P3-X465	10428542	
A1268	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X465-2G	10428532	
A1269	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1270	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1271 is not functionally applicable to this system.						
A1272	1	Valve, Manual	1-1/2 in., shutoff	Vacco P/N M-6P-X467-2G	10428531	
A1273	1	Transducer, Temperature	-100 F to 250 F	Aero Research P/N T-5215-1	10465310-1	
A1274	1	Transducer, Pressure	0 to 7000 psig range	Fairchild Controls Corp. Model 990S50-2	10465306	
A1275	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1276	1	Valve, Check	1/2 in. cracking pressure 5 psig maximum	Security Valve Co. P/N A1127-1	10428539	
A1277	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1278	1	Valve, Manual	2-1/2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	
A1279	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1280	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1281	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1282 is not functionally applicable to this system.						

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1283	1	Valve, Manual	1-1/2 in., shutoff	Vacco P/N M-6P-X467-2G	10428531	
A1284	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1285	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1286	1	Valve, Check	1/2 in., cracking pressure 5 psig maximum	Security Valve Co. P/N A1127-1	10428539	
A1287	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1288	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1289	1	Transducer, Temperature	-400 F to + 2500 F	Aero Research P/N T-5215	10465310	
A1290	1	Transducer, Pressure	0 to 7000 psig range	Fairchild Controls Corp. Model 990550-2	10465306	
A1291	1	Gage, Pressure	0 to 10,000 psig range, 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1292	1	Sampling Point		AN 814-4C		
A1293	1	Valve, Check	2-1/2 in.	Vacco P/N CLV-6P-X469	10428537	
A1294	1	Switch, Differential Pressure	Actuates at 50 psid	Barksdale Valves P/N 9653-1-H-D		
A1295	1	Valve, Manual	2-1/2 in.	Vacco P/N M-6P-X469-2G	10428530	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1296	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1297	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1298	1	Valve, Manual	2-1/2 in., shutoff	Vacco P/N M-6P-X469-2G	10428530	
A1299	1	Switch, Differential Pressure	Actuates at 50 psid	Barksdale Valves P/N 9653-1-H-D		
A1300	1	Valve, Check	2-1/2 in.	Vacco P/N CLV-6P-X469	10428537	
A1301 is not functionally applicable to this system.						
A1302	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1303	1	Filter	20 microns	Microporous Filter Div. of Circle Seal P/N F-4297	10428543	
A1304	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1305	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1306	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A1307	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1308	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A1309	1	Filter	20 microns	Microporous Filter Div. of Circle Seal P/N F-4297	10428543	
A1310	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1311	1	Tank, Storage	6000 psig He storage; 200 cu ft capacity	A. O. Smith Corp P/N MV-50717 & MV-50717A	1042861	
A1312	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1313	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1314	1	Valve, Check	3/4 in.	Vacco P/N CLV-6P-X464	10428538	
A1315	1	Valve, Check	3/8 in., cracking pressure 5 psig	Security Valve Co. P/N 33860-1	10428549	
A1316	1	Valve, Manual	3/4 in., shutoff	Vacco P/N M-6P-X464-2G	10428553	
A1317	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1318	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1319	1	Gage, Pressure	0 to 16,000 psig range; 6000 psig normal indication	Cardair P/N AS-45406	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1320	1	Regulator, Pressure	Cracks at 3500 psig; fully open at 6000 psig	Cardair P/N 35100041	Part of 10428623	
A1321 is not functionally applicable to this system.						
A1322	1	Gage, Pressure	0 to 300 psig range; 120 psig normal indication	Cardair P/N AS-45399	Part of 10428623	
A1323	1	Valve, Solenoid	NC	Cardair P/N AS-15572	Part of 10428623	
A1324	1	Unloader		Cardair P/N AC-45548-G2	Part of 10428623	
A1325	1	Valve, Check		Cardair Stock No. 16133	Part of 10428623	
A1326	1	Valve, Relief	Relieves at 6400 ($\pm$ 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1327	1	Valve, Relief	Relieves at 6400 ($\pm$ 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1328	1	Valve, Check	3/8 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428549	
A1329	1	Valve, Manual	3/8 in., vent	Vacco P/N NVA-6P-462-2G	10428553	
A1330	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	
A1331	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1332	1	Filter	20 microns	Microporous Filter Div. of Circle Seal P/N 40842	10428558	
A1333	1	Regulator, Pressure	Cracks at 3500 psig; fully open at 6000 psig	Vacco P/N BPR 6P-X466-04	10428581	
A1334	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X466-2G	10428556	
A1335	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428559	
A1336	1	Transducer, Temperature	-100 to + 250 F range	Aero Research P/N T-5215	10465310-2	
A1337	1	Flowmeter	200 to 600 scfm range	Cox Inst. Div. Model 12 SCRF	10465309	
A1338	1	Transducer, Pressure	0 to 7000 psig range	Fairchild Controls Model P/N 990S50-2	10465306	
A1339	1	Valve, Relief	Relieves at 6400 (± 100) psig	Ladewig Co. P/N 158SFF	10428540	
A1340	1	Valve, Manual	3/8 in., vent	Vacco P/N NVA-6P-462-2G	10428553	
A1341	1	Valve, Check	3/8 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428549	
A1342	1	Valve, Manual	3/8 in., vent	Vacco P/N NVA-6P-462-2G	10428553	
A1343	1	Valve, Check	3/8 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428549	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1344	1	Valve Manual	1/4 in., gage shutoff	Vacco P N NV-6P-401B-2M	10428535	
A1345 is not functionally applicable to this system.						
A1346	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X466-2G	10428556	
A1347	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1348	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1349	1	Holder, Desiccant	Water and oil removal, 0.3 microns min	Robbins Aviation, Inc. Model RAF-6SP-773 P/N A-803-3-773	10428557	
A1350	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X466-2G	10428556	
A1351	1	Valve, Check	1 in.	Vacco P/N CVL-6P-X466		
A1352 is not functionally applicable to this system.						
A1353	1	Valve, Manual	3/4 in., shutoff	Vacco P/N MA-6P-464-2G	10428552	
A1354	1	Valve, Manual	1/4 in., vent	Vacco P/N NVA-6P-401-2G	10428554	
A1355	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1356	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Helicoid P/N 3341	10428548	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1357	1	Valve, Relief	Relieves at 2800 (± 100) psig	Ladewig Co. P/N 158SFF	10428550	
A1358	1	Filter	20 microns	Microporous Filter Div. of Circle Seal	10428547	
A1359	1	Valve, Manual	1/4 in., vent	Vacco P/N NV-6P-4018-2M	10428535	
A1360	1	Valve, Check	1/4 in., cracking pressure 2 to 4 psig	Security Valve Co. P/N 33860-1	10428598	
A1361	1	Valve, Check	1 in.	Vacco P/N CVL-6P-X465	10428546	
A1362	1	Valve, Manual	1 in., shutoff	Vacco P/N M-6P-X465-2G	10428532	
A1363	1	Coupling, Quick-Disconnect		AN 815-8C		
A1364	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Helicoid P/N 3341	10428545	
A1365	1	Regulator, Pressure	2200 to 120 psig pressure reduction	Cardair P/N AS-46359	Part of 10428623	
A1366	1	Gage, Pressure	0 to 5000 psig range; 2200 psig normal indication	Cardair P/N AS-46002	Part of 10428623	
A1367	1	Valve, Manual	1/4 in., vent	Cardair P/N AC-15812	Part of 10428623	
A1368	1	Trap		Cardair P/N AD-45970	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1369	1	Valve, Solenoid	1-1/2 in., 2-way, NC	Cardair P/N AS-4600	Part of 10428623	
A1370	1	Heat Exchanger	3/4 in., coil, 2nd stage	Cardair	Part of 10428623	
A1371	1	Trap		Cardair P/N AC-45989	Part of 10428623	
A1372	1	Gage, Pressure	0 to 3000 psig range	Cardair P/N AS-45301	Part of 10428623	
A1373	1	Heat Exchanger	3/4 in., coil, 4th stage	Cardair	Part of 10428623	
A1374	1	Gage, Pressure	0 to 16,000 psig range; 6000 psig normal indication	Cardair P/N AS-45406	Part of 10428623	
A1375	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A1376	1	Trap		Cardair P/N AC-45991	Part of 10428623	
A1377	1	Switch, Pressure	Actuates at 6400 psig	Cardair P/N AS-45299	Part of 10428623	
A1378	1	Separator, Mechanical	Water and oil removal	Cardair P/N AS-45984	Part of 10428623	
A1379	1	Filter	7 to 10 microns	Cardair P/N AC-46203	Part of 10428623	
A1380	1	Valve, Manual	3/4 in., vent	Cardair P/N AS-30700	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1381	1	Valve, Manual	3/4 in., shutoff	Cardair P/N AS-30700	Part of 10428623	
A1382	1	Valve, Manual	2 in., shutoff	Vacco P/N M-6P-X464-2G	10428530	
A1383	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1384	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A1385	1	Valve, Manual	1/2 in., vent	Vacco P/N MA-6P-X463-2G	10428534	
A1386	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A1387 is not functionally applicable to this system						
A1388	1	Gage, Pressure	0 to 10,000 psig range; 6000 psig normal indication	Helicoid P/N 3341	10428544	
A1389	1	Valve, Check	2 in.	Vacco P/N CVL-02P-F468	10428583	
A1390	1	Valve, Check	1/2 in., cracking pressure 5 psig max.	Security Valve Co. P/N A1127-1	10428539	
A1391 and A1392 are not functionally applicable to this system.						
A1393	1	Switch Differential Pressure	Actuates at 50 psid	Barksdale Valves P/N 9653-1-H-D		

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1394	1	Switch, Pressure	Actuates at 50 psid	Barksdale Valves P/N 9653-1-H-D		
A1395 and A1396		are not functionally applicable to this system.				
A1397	1	Valve, Check		Cardair P/N 161568	Part of 10428623	
A1398	1	Valve, Check		Cardair P/N 161568	Part of 10428623	
A1399	1	Valve, Check		Cardair P/N 161568	Part of 10428623	
A1400	1	Desiccant, Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A1401	1	Desiccant, Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A1402	1	Desiccant, Holder	Moisture removal	Cardair P/N AS-45456	Part of 10428623	
A1403	1	Valve, Relief	Relieves at 435 psig	Cardair	Part of 10428623	
A1404	1	Valve, Relief	Relieves at 435 psig	Cardair	Part of 10428623	
A1405	1	Valve, Relief	Relieves at 1400 psig	Cardair	Part of 10428623	
A1406	1	Valve, Relief	Relieves at 1400 psig	Cardair	Part of 10428623	

Finding Number	Reqd	Component	Remarks	Vendor	Drawing Number	Elec. Sym.
A1407	1	Valve, Relief	Relieves at 4300 psig	Cardair	Part of 10428623	
A1408	1	Valve, Relief	Relieves at 4300 psig	Cardair	Part of 10428623	
A1409 and A1410 are not functionally applicable to this system.						
A1411	1	Valve, Relief	Relieves at 435 psig	Cardair	Part of 10428623	
A1412	1	Valve, Relief	Relieves at 1400 psig	Cardair	Part of 10428623	
A1413	1	Valve, Relief	Relieves at 4300 psig	Cardair	Part of 10428623	

SECTION 3

MECHANICAL SCHEMATICS

This section contains mechanical schematics that show the functional arrangement of nitrogen and helium storage facility components listed in section 2. For a definition of the mechanical symbols used, see MSFC-STD-162A.

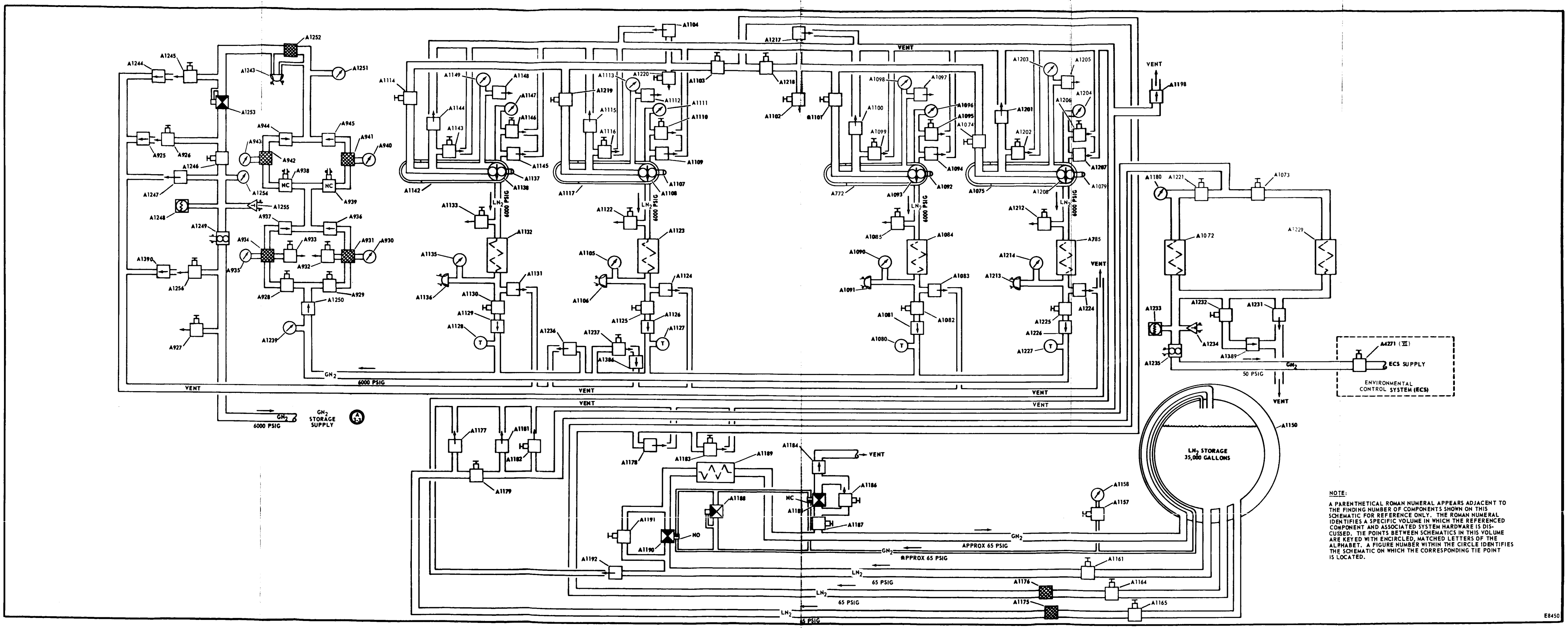


Figure 3-1. Liquid Nitrogen Storage and Nitrogen Compressor Facility - Schematic

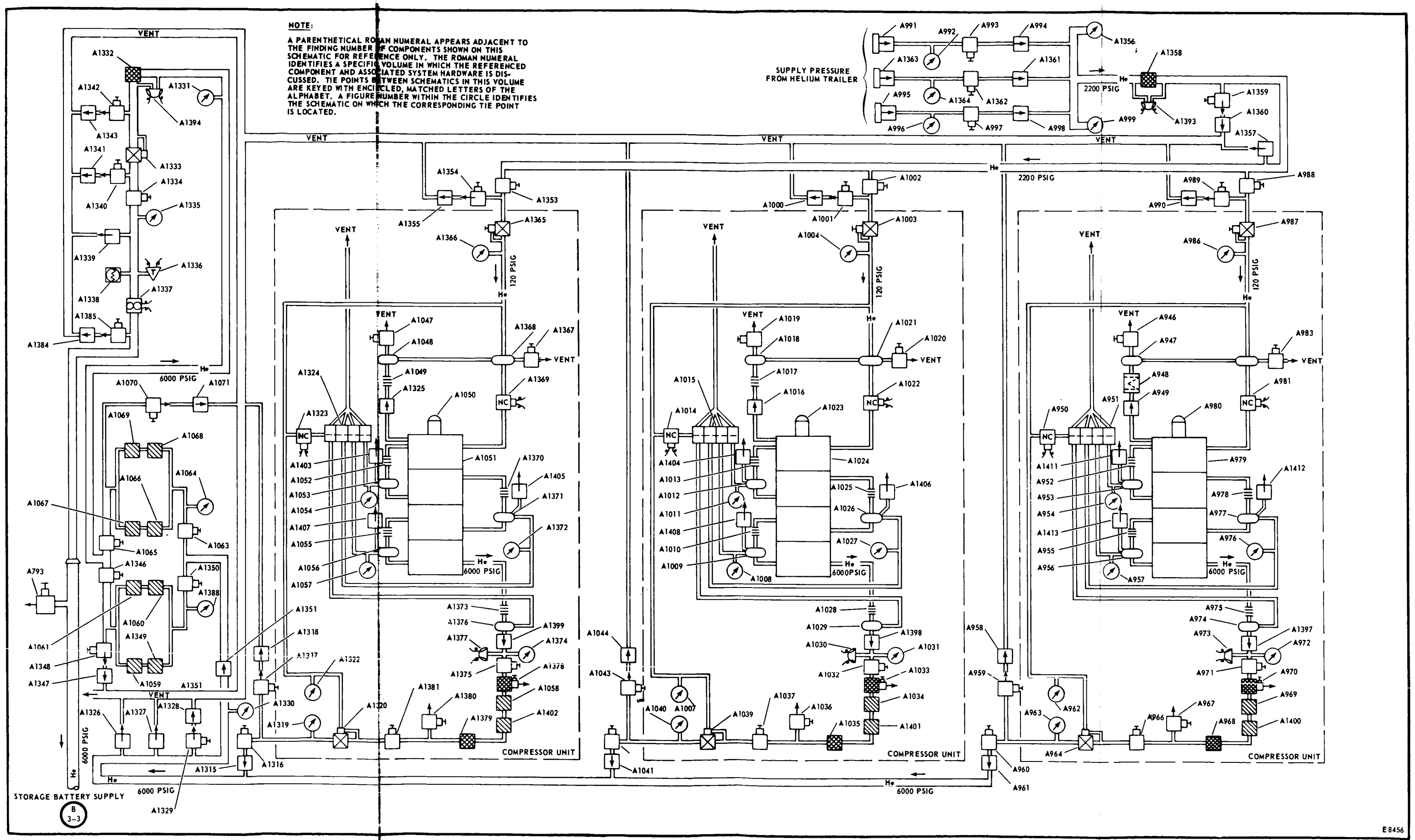
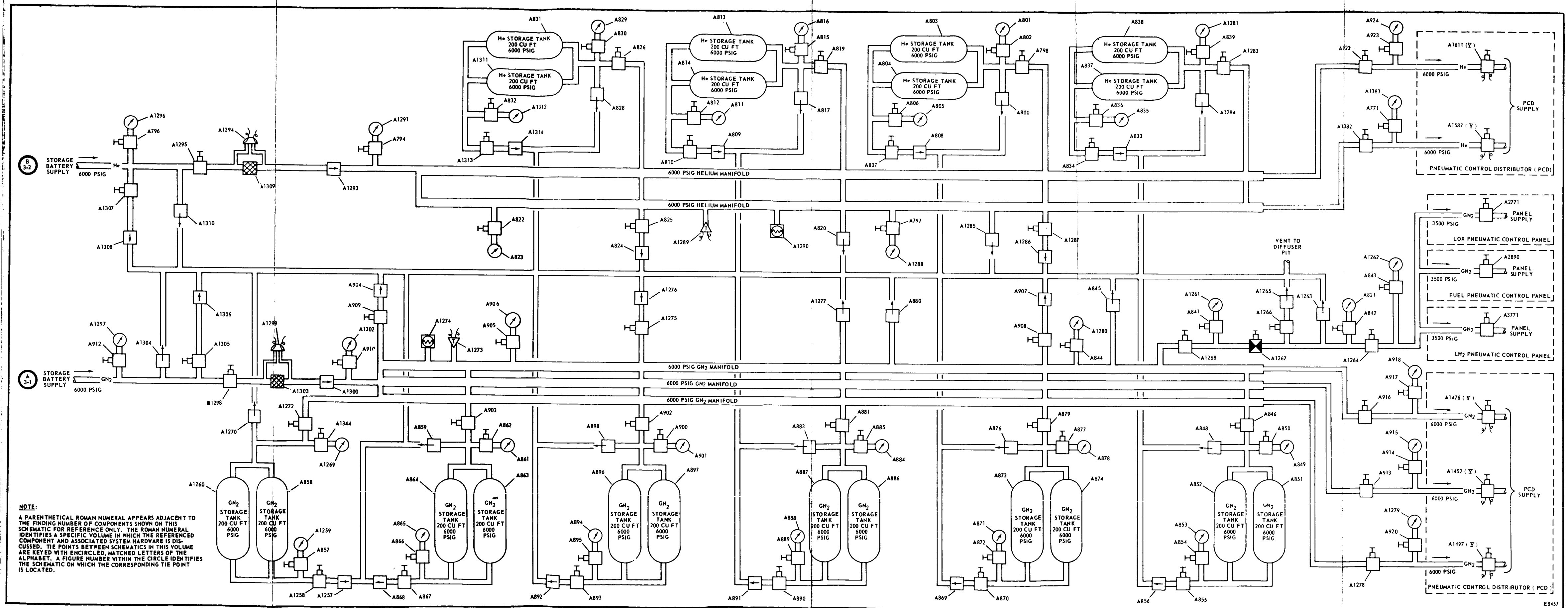


Figure 3-2. Helium Compressor Facility - Schematic



NOTE:

A PARENTHETICAL ROMAN NUMERAL APPEARS ADJACENT TO THE FINDING NUMBER OF COMPONENTS SHOWN ON THIS SCHEMATIC FOR REFERENCE ONLY. THE ROMAN NUMERAL IDENTIFIES A SPECIFIC VOLUME IN WHICH THE REFERENCED COMPONENT AND ASSOCIATED SYSTEM HARDWARE IS DISCUSSED. TIE POINTS BETWEEN SCHEMATICS IN THIS VOLUME ARE KEYED WITH ENCIRCLED, MATCHED LETTERS OF THE ALPHABET. A FIGURE NUMBER WITHIN THE CIRCLE IDENTIFIES THE SCHEMATIC ON WHICH THE CORRESPONDING TIE POINT IS LOCATED.

Figure 3-3. Nitrogen and Helium Storage Facility - Schematic